

Development of the U.S. EPA Remote Sensing Information Gateway (RSIG) 3-D Application

Jim Szykman¹, Todd Plessel², Matt Freeman², and Heidi Paulsen³

¹National Exposure Research Laboratory, Office of Research and Development, US EPA

²Lockheed-Martin, EMVL, U.S. EPA,

³Office of Environmental Information- National Computing Center, U.S. EPA

**Status of Interoperability Efforts in the
Atmospheric Composition/Air Quality Community – Breakout Session**

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RSIG Background

- The Remote Sensing Information Gateway (RSIG) grew out of efforts to explore ways to provide greater access to NASA and NOAA satellite data and EPA modeled data sets for EPA applied research.
- Over the past several years RSIG has focused on extending access and increasing the use to several satellite (aerosol) and aircraft datasets to support EPA applied research.
- The result is an operational web based system capable of providing on-demand access to a variety relevant air quality/atmospheric composition data sets. with functionality to subset in time and space and re-grid on model relevant grids (including 3-D).
- Others Involved along the way include: U.S. EPA (ORD & OAQPS) Modeling Groups, NASA MODIS and CALIPSO Aerosol Science Teams, NOAA-NESDIS (GOES and VIIRS Aerosol Product(s)), MOZAIC/IAGOS PI's, NASA Airborne Data for Assessing Models (ADAM) Developers, and Several NASA AQUEST members

Atmospheric Composition Data Sets

served via U.S. EPA Remote Sensing Information Gateway

System name: EPA Remote Sensing Information Gateway
(<http://ofmpub.epa.gov/rsigserver?index.html>)

Provider Type: Original source and intermediary broker

Types of atmospheric composition data:

Modeled: a subset of CMAQ/MCIP (conc., met., emissions) variables (2002-2008)

Surface Observations: AIRNow: O₃ and PM_{2.5} AQS: O₃, SO₂, NO₂, CO, and PM_{2.5}, NEUBrew total O₃ via v2.5 Umkehr Vertical Profiles

Satellite: (MODIS) L2 MOD04/MYD04 v5.1 variables, L2 MOD06/MYD06 v4.3.0 variables, (CALIOP) L1 CAL_LID_L1 – v3.01 variables, CAL_LID_L2_05kmAPro and 05kmCPro variables, (GOES-east) NOAA GASP

Aircraft: MOZAIC O₃, NO_y, (O₂-O₅), CO, T, P, WD, WS, and RH data (2002-2006) (*restricted to EPA access only under MOZAIC approved project AQ-ALOFT*)

Access: GUI (JAVA based applet) and web services (WCS/WMS)

Standard Web Services Implemented: OGC-WCS and OGC-WMS

Custom extension made to standards: yes

Type of data returned: original data returned- formats supported: binary (xdr), ascii, netcdf (coards & ioapi), and geotiff-float. Data can be regridded onto standard or custom CMAQ grids

Metadata standards used: Defined by project team

Data/Metadata catalogs used: hyperlink to original data provider(s)

Multiple years of U.S. EPA CMAQ (3-D) output is served via web services through RSIG

- US EPA:

- CMAQ v4.7 (2002)

- Eastern US and Western US 12 km (OAQPS runs) 14 layers
 - PM2.5, O3, NOy, AOD Bext, and all variables from conc, aconc, emis, metcro3d, aerodaim, aerovis, and wetdep1 & 2 –NetCDF-IO API.

- CMAQ v4.7 (2002 to 2006)*

- Eastern US 12 km (CDC runs) 24 layers
 - PM2.5, O3, NOy, AOD Bext, and subset of variables from conc, aconc, emis, and met – NetCDF-IO API.

- CMAQ v4.7 (2007-8)

- Extended CONUS 12km (CDC runs) 34 layers
 - PM2.5, O3, NOy, AOD Bext, and subset of variables from conc, aconc, emis, and met – NetCDF-IO API.

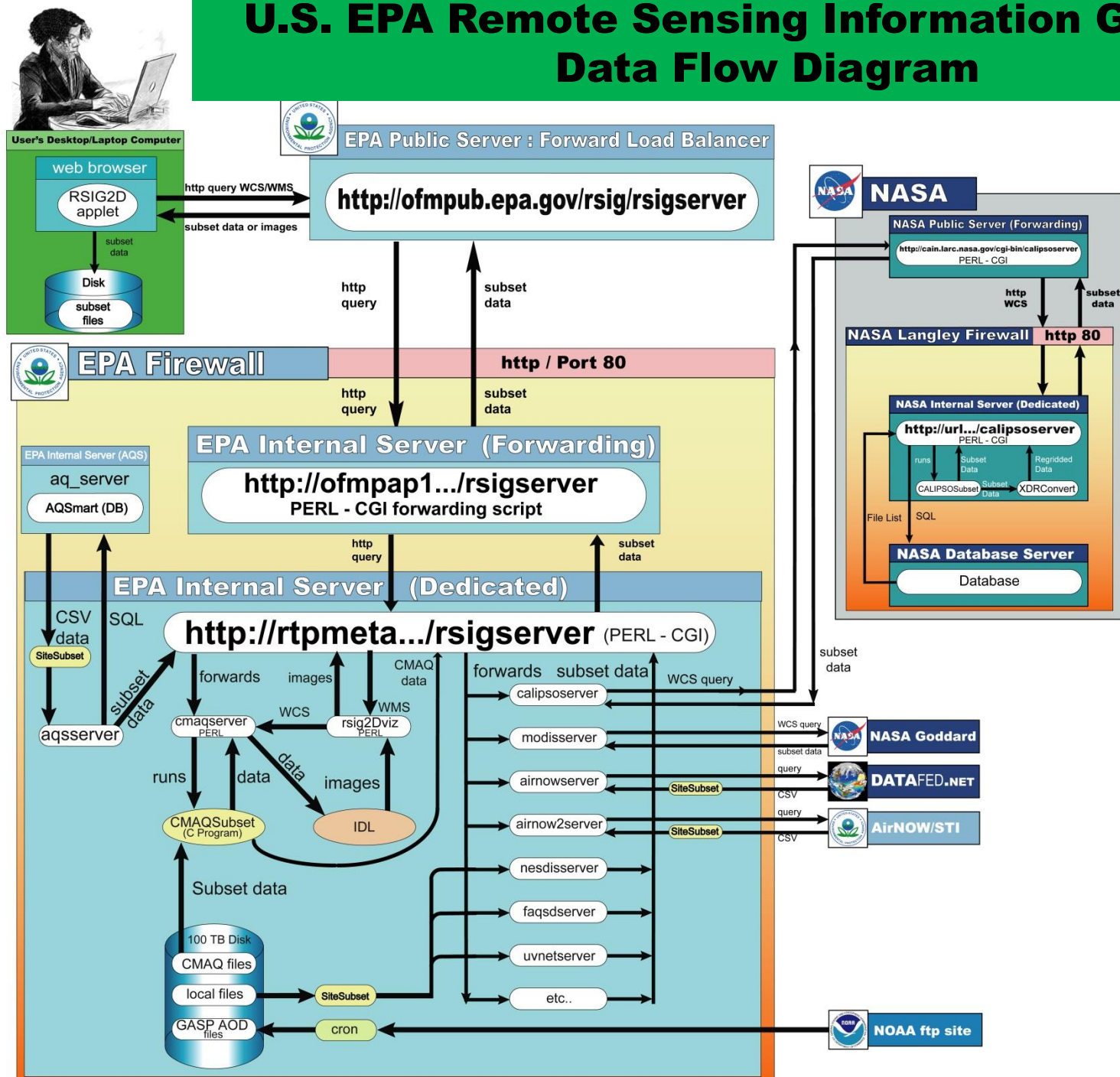
- CMAQ v4.7 and v5.0 (2006)**

- Extended CONUS 12km (AQMEII run) 34 layers
 - PM2.5, O3, NOy, AOD Bext, and subset of variables from conc, aconc, emis, and met – NetCDF-IO API.

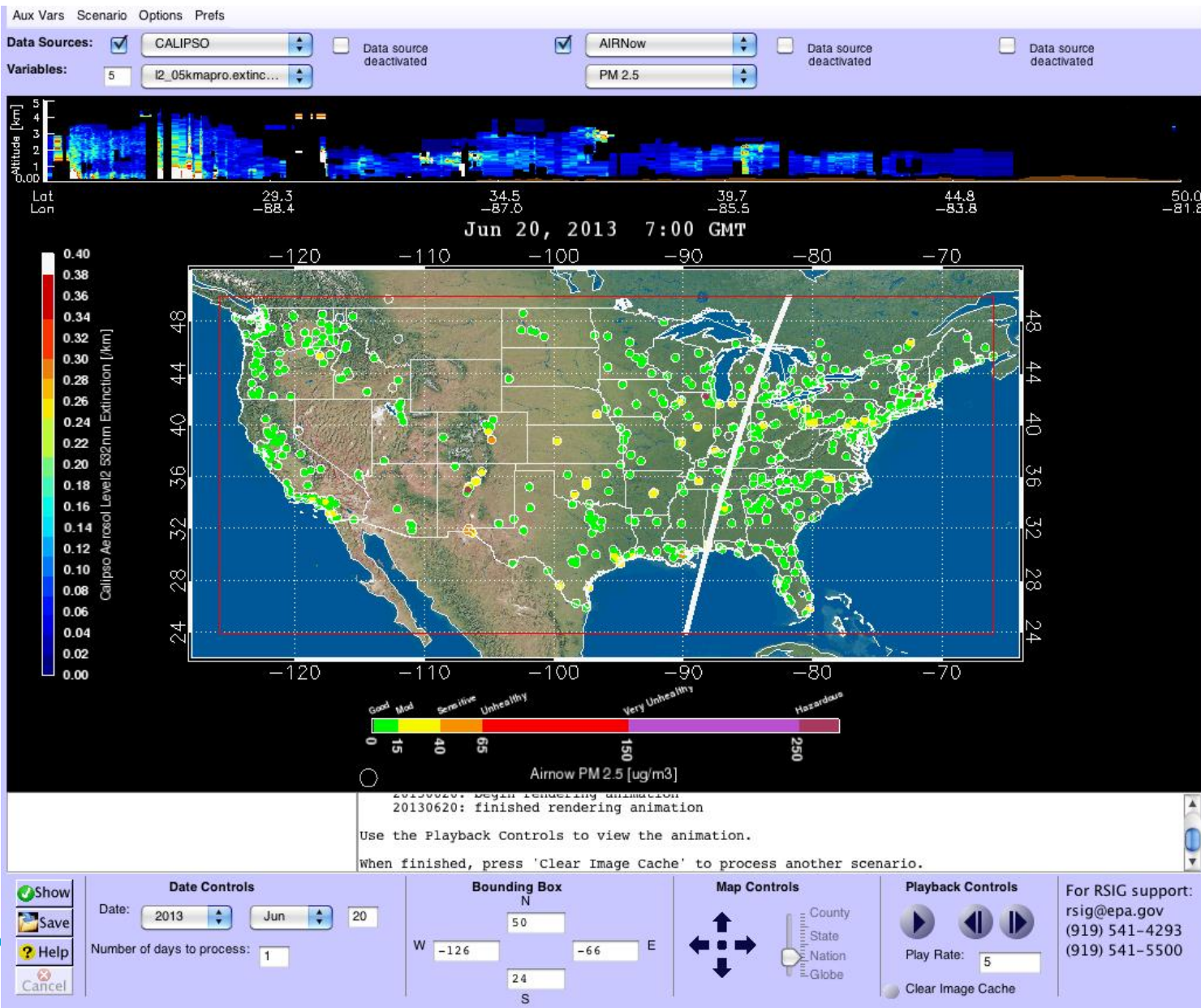
- CMAQ v4.7 (2006)**

- Northern Hemisphere 108 km (Development run) 35 layers
 - PM2.5, O3, NOy, AOD Bext, and subset of variables from conc, aconc, emis, and met – NetCDF-IO API.

U.S. EPA Remote Sensing Information Gateway Data Flow Diagram



RSIG-2D Web GUI



RSIG-3D Application (Currently Under Development)

- Cross platform stand-alone application focused on exploiting use of RSIG available data sets (current and future) for air quality applications.
- Flexibility to add RSIG and non-RSIG developed OGC compliant web services.
- As implied “Application” is focused on use of data versus just data access with was initial focus of RSIG 2D. Initial focus is on application of data sets to model evaluation.
- 3-dimensional to allow for application/analysis functions of relevant data 3-D data (CMAQ, CALIPSO, Aircraft, etc...).
- Initial release targeted for late 2014.

RSIG-3D Application (Currently Under Development)

- Initial development (2014/2015) focused on:
 - Incorporate currently developed RSIG OGC-WCS-compliant PERL-CGI program, rsigserver, to provide access to all datasets currently available via RSIG 2D.
 - Add the ability for users to read files from local directories along with functionality for users to automatically read local model grid files for MM5, WRF, CMAQ and CAMX to generate the navigation and grid information for the regridding step, and incorporate the use of the EPA/NASA developed Spatial Allocator to run under script control via RSIG
 - Develop RSIG Server and Subsetter code to add access to NOAA S-NPP VIIRS AOT (NOAA/NESDIS) and airborne field campaign data sets from the NASA-LaRC ASDC Toolset for Airborne Data (TAD).
 - Begin to incorporate satellite-measurement model evaluation methods developed in support of TF HTAP under NASA AQUEST efforts.

RSIG-3D Application

